Whetham, William Cecil Dampier, and **Whetham,** Catherine Durning. *Science and the Human Mind: A Critical and Historical Account of the Development of Natural Knowledge.* London. Longmans, Green, and Co.; 1912; price 5s. net; pp. xi. + 304.

IT cannot be an easy, and may even be judged an impossible, task to outline in 300 pages the whole history of science and its manifold interactions with religion, philosophy, and civilization, and no two authorities could probably be got to agree on what should be omitted and what emphasized in such an account, or what should be its perspective and proportions. But Mr. and Mrs. Whetham have at least contrived to produce a thoroughly interesting and readable sketch of an immense subject. Its distinctive notes are in the first place the attempt to connect scientific progress in a special way with congenital racial qualities, and particularly with the genius of the North-Western European stocks, and secondly a freedom from dogmatic stiffness and a truly scientific broad-mindedness, which is tolerant (even to excess) of the infinite perversities of the religions and philosophies which for ages thwarted scientific advance, and is always willing to credit them with good sides which were often far from obvious. It is evident that the first of these emphases proceeds from the sound principle that it is always necessary to get at the man behind the work in order to understand the work, and connects closely with the well-known studies in eugenics by which the authors have so honourably distinguished themselves, and continues their eugenical interpretation of history. Indeed, it may be said to give the first sane eugenical reading of the history of thought. At the same time it should be read with a certain amount of caution. The authors could hardly make their interpretation convincing within their limits and with their materials, and without discussing fundamental questions as to how far genius can wholly be credited to the stock which produces it, and is not rather biologically a sport and sociologically a windfall, as to how far social conditions must co-operate with congenital ability to make it effective, as to how far our materials really permit us to be confident about the racial composition of all but the most recent of our distinguished men. At any rate, there should have been some consideration of the opposite view that purity of race is anything but favourable to intellectual fertility and that a (judicious) mixture of races is needed to produce intellectual mobility and to break up the rigidity of traditional habits of thinking, the more so that most (if not all) of the facts adduced lend themselves to this interpretation also. For, after all, the great civilizations have all originated in conquest, and the great nations have all been (and still are) of mixed origin.

The second point we have mentioned conducts us over still more debatable ground. Can literary history supply the materials for writing the real history of science? Is it not far too *bookish*, and too ignorant or contemptuous of *technical* improvements which vitally affected, not only man's control, but also his knowledge, of the world? What does it tell us about the fundamental achievements of man's civilization, *e.g.*, the control of fire, the smelting of metals, the domestication of plants and animals, the invention of the wheel and the lever, the beginnings of religion, the formation of language and of the working "categories" of commonsense? Nothing, or next to nothing. So little is said about the technical discoveries even of the last century, which have transformed the externals of human life and profoundly modified it internally, that the literary histories fail to render intelligible even the political and social history of the time. Mr. and Mrs. Whetham do not altogether overlook the fact that the secret of modern prosperity lies in our reckless prodigality in wasting stored-up coal (p. 156), but they nowhere say outright that the essential difference between civilised and savage man is

due to the former's ever-growing use of machinery. Their work suffers (though less than that of most writers) from what may be called the fallacy of "pure" science and from an insufficient study of the interesting correlations between pure science and applied, which *inter alia* kept up a continuous growth of technical knowledge even in the depths of the Dark Ages.

They consequently fail to see both how much, and why, philosophy and religion have hampered the progress of science. "Pure" science, *in abstraction from applied*, has affinities with its deadliest enemies. It is just as capable of becoming a game as pure metaphysics. It is just as capable of dispensing with verification as the most dogmatic theology. It is just as liable to come under the spell of a false logic as either, and just as incapable of discovering that actual reasoning never conforms to the ideal of formal logic, and is paralysed just in proportion as it tries to. What saves science in the concrete is precisely that application is demanded of it, that its theories must be tested, that its truths must be verified, and that the meaning, the truth, the value, and the validity of every scientific assertion is thus subjected to continuous and unending correction by the course of experience. This great discovery of scientific method has, however, been due, not to logical theorising, but to the exigencies of actual inquiry. Formal logic to this day does not understand it, and will not recognize it. It still holds that "verification" is not "proof," and can never yield (absolute) truth, because it is vitiated by a formal fallacy of "affirming the consequent." No amount of corroboration of a theory ("hypothesis" or "law") by the facts can ever prove the theory absolutely true, because an alternative may always be thought of which explains the same facts (and perhaps others as well) even better. Now, the reply of science to this criticism is simple. It should say—it is clear, then, that you logicians have not correctly analysed our procedure. It is not concerned with "valid" proof and "absolute" truth at all. We hold a doctrine true because, and so long as, it forms the *best* formula for dealing with the "facts" we have reason to consider relevant to it. It may thus be the best to-day and no longer to-morrow, when it will have to be called an "error" which has led to a better "truth." In principle, therefore, we neither have nor want "eternal" and "absolute" truths, which we should have no right to alter for the better. And we observe also that, in fact, whatever you may say, neither you nor any one else has them, or could use them if he had. All real knowledge, therefore, does in fact conform to the model of scientific procedure, and what does not is illusory.

That such is the fact our authors are much too good scientists not to see (p. 280 f.). But they are too apologetic about it. Science has no need to be ashamed of its "essentially provisional working hypotheses." It should be proud rather of having rendered the human mind aware of its own operations, and of having, however tardily, taught philosophy the real nature of knowledge. Philosophy is at last beginning to understand it, and has, infelicitously, named the lesson "Pragmatism"; but to have forced it into the philosophic mind, though one of the latest, is not one of the least of the *theoretic* triumphs of science.

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